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Gender Dynamics of Small Holder Acha Rice Farmers Food Security in Kaduna State, Nigeria

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Abstract

This study examined gender dynamics of smallholder acha rice farmers' food security in Kaduna State, Nigeria. The primary data were collected from 204 female and 231 male acha rice farmers using structured questionnaire. The statistical tools used to analyze the data were descriptive statistics and multidimensional food security approach. Acha production in the study area are dominated by married groups male (74%) and female (90%); average age of 42 years for male and 39 years for female respectively. four coping strategies were prominent among the available strategies employed. These were reduced volume of meals, reduced number of meals, sales of production and diversify production. Based on the findings of this study, it could be concluded that majority of male acha rice farming households were found to be more food secure than their female counterpart. Given that acha rice is an important food crop in Nigeria, any attempt to increase its productivity would be a right step towards the resolution of food crisis; jobs can be directly created from enhanced acha rice production with small improvement in the technology which will increase household income and consequently reducing food insecurity. Apart from ensuring a food security and empowering women, increased acha rice production will provide more employment opportunities for the unemployed citizens in the country. Food insecurity coping strategies adopted by the farming households have short term effect. Therefore, there is the need to increase the volume of food production as well as improve on access to income generating activities that are more sustainable.

Keywords: *Ach rice, Food security, Gender*

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Background to the Study

Acha rice (Hungry rice), is a crop that fits well into the low-input farming systems of the resource-poor farmers as it has a unique ability to tolerate poor and marginal soils and can withstand drought (Umaru and Hassan, 2018). The plant is known by different names in various communities in Africa: such as Acha in Nigeria, Findi in Senegal, Findo in Gambia, Fonio in Serria–loan, Founde in Mali, Foni in Burkinafaso, Kpendo in Guinea, Podgi in Benin Republic, Pom/Polin in Cote- devior and Hungry Rice in English (Abdurrahman et al., 2015; Gyang and Wuyep, 2005), Acha does not require much rich soil to perform well, and therefore, can grow on wide range of soils except on a very clayed soil. It was once counted among the lost crops of Africa due to utter neglect in cultivation and improvement. The neglect was partly attributed to the tediousness in the production process, because of its tinny seed of 0.4 – 0.5 mm , and couple with the fact that all operations are done manually—zero mechanization; and in addition Scientist were said to have misunderstood it very much.

According to FASOSTAT (2019), a total area of 347, 350 ha was devoted to acha cultivation in Africa in 2002 with Nigeria providing almost half of the area. CBN, 1998 estimated that about 70,000 metric tons of acha was been produced annually in Nigeria. However, average yield per ha of acha has been as low as 600 – 700 kg /ha (Cruz, 2014). Acha is assumed to gradually being rediscovered and considered for improvement as valuable and cultivated crop (Ibrahim, 2017). The crop is perhaps one of the world's fastest maturing cereals, producing grains just 6 – 8weeks (42 – 56 days) after they are planted for the extra-early varieties (Ibrahim, 2017). The late maturing varieties take up to 150 days to grow to maturity (CIRD, 2014).

The effort to increase rice production has been achieved largely through increase in the hecta rage rather than using productivity-improving technologies (Ajewole *et al.*, 2015; Abdulazeez et al., 2018). Within this rice production system, women have been reported to play a crucial role in farming, processing and marketing and it is estimated that over 60 percent of all agricultural production, processing and marketing activities were carried out by women (Yusuf, 2015).

However, a body of empirical evidence from many different countries shows that female farmers are just as efficient as their male counterparts, but they have fewer resources, resulting in inadequate use of resources, limited alternatives and low income so they produce less (Yusuf, 2015). Women are a key stakeholder in agriculture, yet they face numerous formidable obstacles (Kandiwa, 2013). Ayinde *et al*. (2013a) opined that, it is of importance to have strategy to put men and women's concerns and experiences at the centre of research design, implementation, monitoring, and evaluation. Bridging the gap in access to technology between men and women, we could increase productivity; Ayinde *et.al*. (2013b) further affirmed that technological adoption among male and female farmers is crucial to improving the productivity in the face of climate change.

Maximizing household income is not always sufficient to maximize the food security of all its members for the same reasons that national food availability does not necessarily translate

into household food security. In Nigeria, there is evidence that women appear to take a much greater role in assuring the food requirements of their dependents in situations of economic deterioration. So that situations where women produce and/or control the resources by which their own nutritional needs and those of their families are met are likely to be associated with enhanced food security of all members (Bala, 2015).

Gender inequalities and lack of attention to gender in agricultural development contribute to lower productivity, and higher levels of poverty as well as under-nutrition (World Bank, FAO and IFAD, 2009; FAO 2011). The 2012 World Development report dedicated to Gender Equality and Development warns that the failure to recognize the roles, differences and inequities between men and women poses a serious threat to the effectiveness of the agricultural development (World Bank, 2012).

Gender has proven to be an essential variable for analyzing the roles, responsibilities, constraints, opportunities, incentives, costs and benefits in agriculture (Koyenikan, 2010). Gender relations are influenced by ethnic origin, age, religion, traditions, ideologies, societal perceptions as well as cultural and economic conditions. Gender gap is manifest in various facets of life. In agriculture, this include among others, access to and control of resources, as well as division of labour at the household level and among farming activities (Danso *et al.*, 2004; Abdulazeez *et al.*, 2018). Access to productive resources/inputs is an obstacle to agricultural growth in Africa, thus access to productive resources such as land, modern inputs, technology, education and financial services is a critical determinant of agricultural productivity (FAO, 2011). There is dearth of gender disaggregated research and documentation data in gender differential in acha rice production on food security. It is, therefore necessary to assess gender differential in acha rice production on food security in the study area.

Material and Methods

The Study Area

Kaduna is divided into three agricultural zones namely, Northern zone, central zone and the Southern zone. The Southern zone is chosen for this work due to the large scale ginger production from the region. Southern Kaduna is situated within the central high plains of Northern Nigeria. It is located between longitude 5° E and 7° E of the prime meridian.

Southern Kaduna is made up of about 12 local governments which include: Jemaá, Jaba, Kaura, Kauru, Zango-Kataf, Kagarko, Kachia, Sanga, Kajuru, Chikun, Kaduna-South and Lere. With the respective populations: Economically, over 60% of the people engage in farming, hunting and trading. Although of the three, farming dominates the occupation practiced by the people are: livestock rearing, food and cash crops which includes; Ginger, Soya beans, Maize, Ginger (guinea corn), Millet, Cassava, Yam tubers, and acha among others.

The rainfall is evenly distributed from the months of April to October with an average of 1,524mm.There are two marked seasons in the State, the Dry windy season and the Rainy (wet) Seasons. The wet season is usually from April through October with great variations as

you move North-Wards. On the average, the State enjoys a rainy season of about five months (KADP, 2000). There is heavy rainfall in the southern parts of the state like Kafanchan and northern parts like in Zaria with an average rainfall of about 1016mm. The State extends from the tropical grassland known as Guinea Savannah to the Sudan Savannah in the North. The grassland is a vast region covering the Southern part of the State to about Latitude 1100" North of the equator. The prevailing vegetation of tall grass and big trees are of economic importance during both the wet and dry season.

Sampling Procedure

A multi stage sampling technique was used. The first stage involved a purposive selection of two Local Government Areas (LGAs) which includes, Jaba and Kachia. The selection is due high concentration and intensity in acha rice production in these areas. The second stage involved a random selection of three villages from each of the LGAs. This gave a total of 6 (Nok, Kurmin Jatau, Fai, Assako, Yarbung 1 and Gidan tagwai) villages. The third and final stage involved a stratified sampling method in selecting female and male acha farmers from each of the villages. Therefore, seventy (70) percent of the female acha farmers were selected thus given a total of 204 female acha farmers' while ten (10) percent of the male acha farmers' was randomly selected using ballot techniques and therefore, given a total of two hundred and thirty one (231) male acha farmers. The last stage involves using a Yamanes (1967), formula adopted by Abdulrahman, Mani, Oladimeji, Abdulazeez, and Ibrahim (2017) for calculating sample size based on the assumption of 5 % expected margins of error, 95 % confidence interval and applying the finite population correction factor. The formula is expressed as follows:

$$n_0 = \frac{N}{1+N(e^2)}$$

Where: n_0 is the sample size without considering the finite population correction factor; e = 0.05; N = total number of observations. Finally, a total of four hundred and thirty-five (435) female and male acha rice farmers were used for this study.

Data Collection and Analysis

The primary data were obtained by the use of structured questionnaire administered to acha rice farmers in the study area.

Model Specification

Calorie Proxy Indicator

The caloric proxy calculates the calories per capita based on food produced and consumed by a household (Cadre Harmonise Manual, 2014). The quantity of food produced and purchased for consumption in local measures was first converted to kilogramme and further to calorie and then divided by the household size adjusted for adult equivalence using the equivalent male adult scale weight. To obtain the calorie consumed per day per household, the result was further divided by 365 days and then compared with the standard of 2400kcal according to the Food and Agriculture Organization. The calorie equivalent of commonly eaten foods in Nigeria was used to estimate the calorie intake of household. The households whose daily per capita calorie intake was up to 2400kcal could be regarded as food secure while those below 2400kcal could be regarded as food insecure.

Household Hunger Scale (HHS)

The Household Hunger Scale is an experience based indicator developed from the Household Food Insecurity Access Scale (HFIAS) to include set of questions that were valid for cross context comparisons (Leroy *et al.*, 2015). It asks for the occurrence of increasingly severe experiences of food shortage. The standard recall period for this scale is 30 days. The HHS reflects poor access to both quantity and quality of food. This scale is limited because it measures only the most severe food insecurity experiences and focuses only on the quantity of food accessed. It is appropriate for situations in which a large number of households are expected to be severely food insecure.

Accessibility Index

Accessibility is probably the more difficult dimension of food security to analyze as it intrinsically includes very different aspects: economic, physical and social access all together shapes the possibility for a person to access the food. The variables selected to analyze economic access for the households were: Prices of food consumed, Land Size under cultivation, Output from acha rice, Sales from acha rice output and Income from primary occupation**.** To construct the accessibility index, the minimum and maximum value of the variables are used which are gotten from the data (Majumdar, 2015). Individual indices for each of the variables are first computed by the general formula:

$$\text{Index} = \frac{\text{Actual } x_i \text{value} - \text{Minimum } x_i \text{ value}}{\text{Maximum } x_i \text{ value} - \text{Minimum } x_i \text{value}} \ldots\ldots\ldots\ldots$$

Min-Max normalizes the variables in order to have an identical range (0, 100) by subtracting the minimum value and dividing by the range of the indicator values. The indexes can then be ranged and classified into high, medium and poor accessibility.

$$\text{Accessibility Index} = \frac{\text{PFC Index} + \text{LSC Index} + \text{OG Index} + \text{SGO Index} + \text{IPO Index}}{5}$$

Where;
PFC = Price of food consumed
LSC = Land Size under cultivation
OG = Output from Acha rice
SGO = Sales from Acha rice Output
IPO = Income from Primary Occupation

Food Consumption Score (FCS)

The Food Consumption Score for each household was computed by summing up the products of the consumption frequency for each food group and its corresponding assigned nutritional weight. As such, the FCS is a composite measure of dietary diversity, food frequency, and relative nutritional importance of different food groups. Data on these parameters were collected for each household using a 7-day recall. The food frequency was measured as the number of days a particular food group was consumed in the seven days. Table 3.2 shows the food groups and weighting applied to each based on their respective nutritional values. The FCS for each household was computed by summing up the products of

the consumption frequency for each food group and its corresponding weight. Household FCSs equal to and below 28 were categorized as poor, those between 29 and 42 as borderline, and the ones above 42 as acceptable (WFP, 2008; Butaumocho and Chitiyo, 2017). The score is calculated as follows:

FCS = WcerealDcereal + WlegumesDlegumes + WvegetablesDvegetables + WfruitsDfruits + WanimalproteinDanimalprotein + WdiaryproductDdairyproduct +WsugarDsugar.

Where, W= Weight attributed to the food group; D = Number of days each food group is consumed The table below shows the types of foods taken into account, their corresponding food groups, and the weight attributed to each group.

Table 1: Food groups and weight

Types of foods	**Food group**	**Weight**
Maize, millet, sorghum, rice, bread/doughnuts, pasta Cassava, yams, plantains, other tubers	***Cereals and tubers***	***2***
Groundnuts/legumes (beans, cowpeas, peas, etc.)	***Legumes***	***3***
Vegetables (+ leaves)	***Vegetables***	***1***
Fruits (mangoes, oranges, bananas, etc.)	***Fruits***	***1***
Meat, fish, seafood, snails, eggs	***Animal proteins***	***4***
Milk/dairy products	***Dairy products***	***4***
Sugar, honey, other sweets	***Sugar***	***0.5***
Oils and fats	***Oils***	***0.5***
Condiments, spices	***Condiments (*)***	***0***

Source: Cadre Harmonise Manual (2014)

Household Dietary Diversity Score (HDDS)

This indicator captures the number of different kinds of food groups that the household has consumed and the frequency with which they eat them over a given reference period. It sometimes involves weighting these groups with the result being a score that represents the dietary intake but not necessarily the quantity. It is similar to the Food Consumption Score but does not provide information on the frequency of consumption of the food groups and does not assign weights to food groups based on the nutritional value. It is computed by a binomial variable that has two values and attaching them to the food groups. Then the binomial variables are summed to create the Household Dietary Diversity Score. The new variable will have a range from 0 through the maximum number of food groups collected. DDS has been confirmed to have high correlation value with utilization indicators like birth weight, child anthropometric measures, improved haemoglobin concentrate and reduced occurrence of hypertension. It recognizes the existence of hidden hunger which stems from micronutrient deficiency. The HDDS which ranged between 0-12 was used to measure household's dietary diversity and also ranked accordingly into high dietary diversity (6-12) and low dietary diversity (0-5) (FAO, 2008; Wineman, 2014).

Stability Index

To be food secure, the household must be guaranteed of availability of food, of access to adequate food and of its proper utilization at all times, in other words in a stable way. The selected variable used to measure this dimension was the stock level of food items of the household. The households were asked questions on how long the various categories of food items can last with referenced periods to choose from. This variable, gives an immediate picture of the management of the stocks of food items highlighting how much a household is able to face food deficiencies through its stocks. The stability index was computed similarly to the accessibility index which involved setting the minimum and maximum values in order to transform the indicators into indices between 0 and 1. The stability indexes of the households can be classified based on the range of values into; Poor food stability, Acceptable food stability and Stable food stability.

Results and Discussion

Socio-economic characteristics of the farmers

Table 1 revealed that acha rice farmers in the study area are dominated by married groups male (74%) and female (90%); average age of 42 years for male and 39 years for female respectively. The household size was adjusted using Organization for Economic Corporation and Development Scale (OECD). The result revealed that adjusted household size for male was 6.7 and 4.5 for female and female household members. This finding is in line with Mahabub and Jaim (2011), the average family size of male farmers' household was found to be 6 while it was 5 for the female farmers. Although, they observed that the family size of both female and male farmers' household was of not much difference. The estimated mean years of schooling of sampled farmers were 12.7 and 8.4 years for both sexes, though skewed towards the formal education and above 2011 United Nation Development Programme mean education index of 5 years for Nigeria. This finding is at variance with Olaleye *et al.* (2009) revealed that 65% of the farmers in their study did not have formal education especially the women. The study also revealed that 60% of the male farmers had up to 8 years' experience and 74% of female farmers had 4 years in irrigated rice farming. The level of investment, area devoted for irrigated rice farming and average income rice output depict in Table 2 also revealed that the irrigated rice farming is still largely subsistence. Also, the low level of investment could stem from incentives provided by the government as assistance in the form of provision of farm input like improved rice seeds, fertilizers, herbicides.

Table 2: Summary statistics of the socio-economic characteristics of respondents

Variables	Unit	Male	Female
MMM Marital status	Married=1 otherwise=0	74% were married	90% were married
Age	Years of schooling	46% below 50 yrs	42% below 40 yrs
Level of Education	Years	81% are literate	60% are literate
Farming experience	Years	60% had up to 10 yrs	53% had up to 13 years
Household size	Number	55% had 4-8 persons	55% had 4-8 persons
Level of investment	(₦)	70% invest< ₦120, 000	70% invest< ₦120, 000
Labour components	Years	61% used family labour	61% used family labour
Access to Credit	Access =1 otherwise=0	70% without credit	90% without credit

Multi-index (Robustness) Approach on Food Security

Food Availability: Calorie proxy was used as an indicator for food availability. The result as presented in Table 3 shows that majority of male (85%) and female (98.3%) farmers were not able to supply adequate calories to meet FAO recommended daily energy levels of 2260 kilo calories per person per day. The average calorie intake of 2050 kcal obtained for male acha farmers was high due to high consumption of cereal- based diets, providing more than 80% of the energy on average, with protein from animal-sourced food being very limited. The decline of 1640 kcal was due to activities of land degradation and insecurity. This finding is at variance with Saleh *et al.*, (2018) whose results showed that the average daily per capita calorie intake of the households was about 3175 calories in Kaduna state.

Food Accessibility: In Table 3, about 85% of the farmers had access to sufficient and nutritious food affected while at present 62% had no access to food. The average value for the accessibility index male was 0.541 indicating that the farmers' households had moderate access to food in the study areas before. However, average value for the accessibility index at present was 0.182 which implies that the households barely had access to food. The problem of food insecurity is not only caused by insufficient supply of food, but also due to land degradation in the study area. according to Ahmed *et al*. (2017). The poor accessibility in the study areas can be attributed to possible factors such as price fluctuations for consumable items, inputs and outputs, coupled with stagnant rate of income growth, inability to access larger expanse of land due to armed conflicts between tribes, bandit and cattle rustlers amongst many other economic accessibility limitations.

Utilization: Food Consumption Score was used to assess food utilization by the farming household. The result in Table 3 presents the results of the farming households classified according to the food consumption groups based on the food consumption computation. The result shows that 30% of the male farmers had poor food consumption while 67% at present had poor food consumption. The households had an average food consumption score of 25.8 male and 19.8 at present. this average food consumption score of 25.8 male falls in the Borderline food consumption group which corresponds to diet that is dominated by cereals eaten on a daily basis while this average food consumption score of 19.8 for female falls in the poor food consumption group, this situation was worsen by incidence of cattle rustling and banditry activities in the study area.

Table 3: Multi-index (Robustness) Approach on Food Security

		Female		Male	
Caloric Proxy Classification	**Range**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Very poor calories	800 –1600	138	59.7	137	67
Poor calories	1601–2200	58	25.3	64	31.3
High calories	2201–3200	23	10.0	3	1.7
Very high calories	3201–4000	12	5.0	-	-
Average Kcal	Recommended=2260		2050 kcal		1640 kcal
Accessibility Index Classification					
Poor Accessibility	- 0.820 – 3.310	35	15.3	126	62
Medium Accessibility	3.311– 4.440	112	48.3	61	29.7
High Accessibility	4.441 – 5.550	52	22.7	17	8.3
very high Accessibility	5.551-11.576	32	13.7	-	-
Average			0.541		0.182
Food Consumption Score Classification					
Poor Consumption	2.090 - 24.700	69	30	139	68.3
Borderline Consumption	24.700 – 47.300	139	60	65	31.7
Acceptable Consumption	Above 47.300	12	10	-	-
Average			25.8		19.8

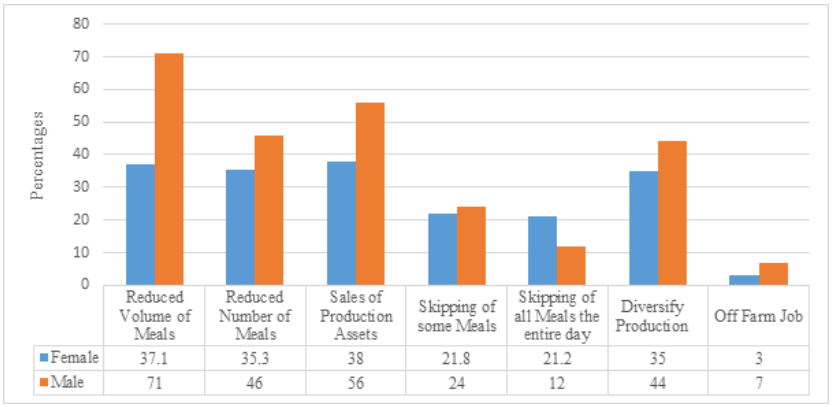
Coping strategies employed by the farmers

The coping strategies employed by the acha rice farming households in periods of food shortages have been summarized and presented in figure 1. It is important to note that some households combined more than one coping strategy to mollify food shortage. Generally, four coping strategies were prominent among the available strategies employed. These were reduced volume of meals, reduced number of meals, sales of production and diversify production. The study indicated that reduced volume of meals (37.1% and 71%) for female and male household heads respectively adopted this coping strategy (fig.1). This finding is in consonance with Yusuf *et al*. (2017), who found this strategy to be the most commonly practiced among small holder crop farmers in Kaduna State. The high rate of use of this strategy in the study area could be linked to the high market price of basic foodstuffs as a result of the current economic recession in the country. The low income of the households compared to high food prices, forces households to resort to reduced quantity and quality consumption of food that the available cash within the household could afford just as Onunka *et al*. (2018) reported in their findings on the household level analysis of food insecurity and coping strategies in Enugu State, Nigeria.

Abut (35.3% and 46%) of female and male household heads reduced the number of meals they ate per day. It was gathered from the responses given through the questionnaire that instead of three-square meal households are forced to either have just two square meals or one in worst cases. This implies that food insecurity situations alter the consumption pattern of the acha rice farming households or force them into unfavorable dietary adjustment. Sales of

production asset and diversify production were strategies adopted by the acha rice farming households in order to cope in periods of food shortage.

Fig. 1:



Conclusion and Recommendation

Based on the findings of this study, it could be concluded that majority of male acha rice farming households were found to be more food secure than their female counterpart. Given that acha rice is an important food crop in Nigeria, any attempt to increase its productivity would be a right step towards the resolution of food crisis; jobs can be directly created from enhanced acha rice production with small improvement in the technology which will increase household income and consequently reducing food insecurity. Apart from ensuring a food security and empowering women, increased acha rice production will provide more employment opportunities for the unemployed citizens in the country. Food insecurity coping strategies adopted by the farming households have short term effect. Therefore, there is the need to increase the volume of food production as well as improve on access to income generating activities that are more sustainable

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